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(Reaffirmed 1993)

Indian Standard

SPECIFICATION FOR TUNGSTEN FILAMENT ELECTRIC LAMPS FOR RAILWAY ROLLING STOCK

(*Second Revision*)

First Reprint AUGUST 1998

UDC 621.326.7 : 625.2

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 5 *April* 1983

AMENDMENT NO. 3 MARCH 2000
TO
IS 897 : 1982 SPECIFICATION FOR TUNGSTEN FILAMENT ELECTRIC LAMPS FOR RAILWAY ROLLING STOCK

(***Second Revision***)

(*Page* 5, *clause* **4.1.2**) — Insert the following sub-clause after **4.1.2**:

'**4.1.2.1** Eccentricity of glass shell with respect to cap axis shall be within ± 3 mm.'

(*Page* 6, *Table* 2, *see also Amendment No.* 1) — Substitute the following for the existing:

Table 2 Dimensions of Lamps

(*Clause* 4.1.2, *and Fig.* 3 *to* 5)

Rated Voltage	**Rated Wattage**	**Light Centre Length**	Maximum bulb Diameter	Maximum Overall Length* Including Solder	Figure Reference Number
(1)	(2)	(3)	(4)	(5)	(6)
V	W	mm	mm	mm	
24/32	15	Actual overall length -1/2 bulb diameter	46	70 ± 2	
	20		46	70 ± 2	
	30		46	70 ± 2	
32	250	80 ± 3	81	121	3
75	25	–	53	72	4
	50	–	61	110	5
110/120	15	–	30	62	4
	25	–	61	103.5	4
	40	–	61	110	5
	60	–	61	110	5
	100	95 ± 2	71	121	–

* When screw cap E-27/27 is used, the maximum overall length may be correspondingly increased.

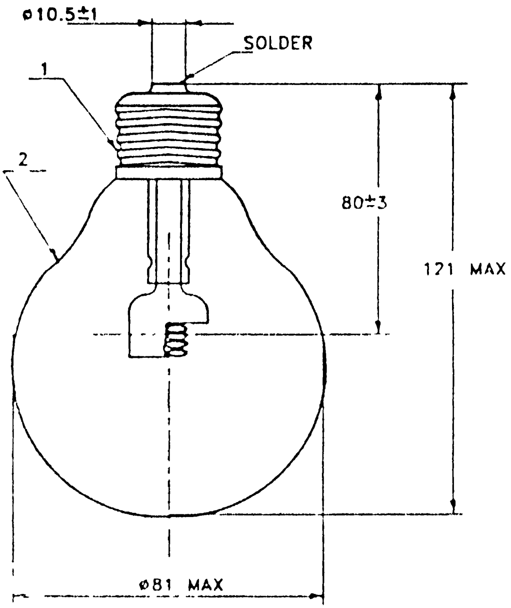

FIG. 3 DIMENSION OF LAMPS 32 V, 250 W

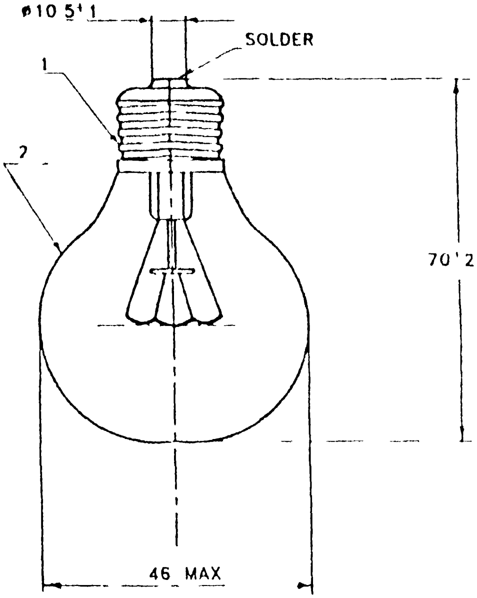

FIG. 4 DIMENSIONS OF LAMPS 24/32V, 15, 20 AND 30 W

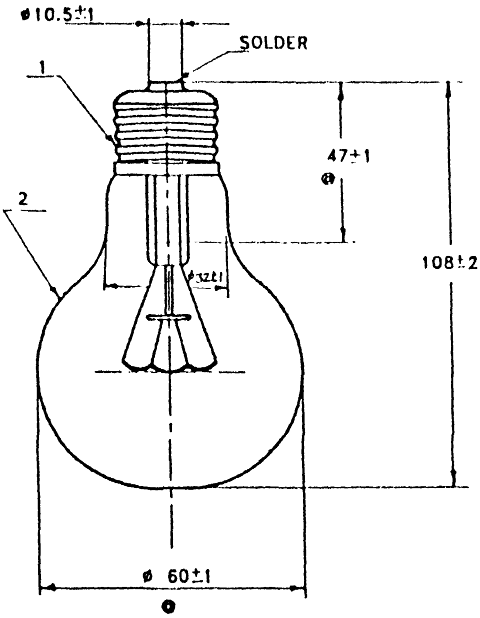

FIG. 5 DIMENSIONS OF LAMPS 110/120 V, 40 AND 60 W

(*Page* 10, *clause* **7.5**) — Substitute the following for the existing:

'**7.5 Insulation Resistance of Bayonet Caps** — The insulation resistance between the shell of the bayonet cap and the contact shall be not less than 5 megohms. The test shall be carried out immediately after the ageing of the lamp (approximately one hour at rated voltage) to ensure proper drying and the measurement shall be made one minute after the application of dc voltage of 500 V.'

(*Page* 10, *clause* **7.5.1**) — Delete.

(*Page* 13, *clause* **7.8**) — Substitute the following for the existing:

'**7.8** The lamp shall be subjected to vibration as per the method given in IS : 9000 (Part 8) : 1981 'Basic environmental testing procedure for electronic and electrical items: Part 8 Vibration (sinusoidal) test.

NOTES

1. The specific requirements for the test is under consideration.

2. The data regarding vibration encountered on railway rolling stocks is as follows:

Type	*Acceleration*		*Frequency*	
	Vertical	Lateral	Vertical	Lateral
Coaches	0.75 to 2.25 g	0 03 to 0.11 g	1 to 10 c/S	1 to 10 c/S
Locomotives	1.0 to 2.0 g	0.6 to 0.9 g	4 to 30 c/S	4 to 35 c/S'

(ETD 23)

Reprography Unit, BIS, New Delhi, India

Ame

AMENDMENT NO. 1 JANUARY 1986

TO

IS : 897 - 1932 SPECIFICATION FOR TUNGSTEN FILAMENT ELECTRIC LAMPS FOR RAILWAY ROLLING STOCK

(*Second Revision*)

(*Page* 5, *Table* 1, *col* 3, *fifth row*) - Add 'or E-27/27' in column three.

(*Page* 6, *Table* 2, *col* 2) - Substitute '50' *for* '30' against 75 V.

(ETDC 23)

Printed at Dee Kay Printers, New Delhi-110015, India

AMENDMENT NO. 2 MARCH 1993
TO
IS 897 : 1982 SPECIFICATION FOR TUNGSTEN FILAMENT ELECTRIC LAMPS FOR RAILWAY ROLLING STOCK

(***Second Revision***)

(*Page* 6, *clause* **4.1.5**) — Substitute the following for the existing entries:

Insulation resistance between the lamp contacts and the shell of bayonet cap in a dry condition when measured in accordance with 7.5 shall be not less than 5 megohms.'

(ETD 23)

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Indian Standard

SPECIFICATION FOR TUNGSTEN FILAMENT ELECTRIC LAMPS FOR RAILWAY ROLLING STOCK

(*Second Revision*)

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(*Continued on page 2*)

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(Continued from page 1)

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Indian Standard

SPECIFICATION FOR TUNGSTEN FILAMENT ELECTRIC LAMPS FOR RAILWAY ROLLING STOCK

(*Second Revision*)

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 August 1982, after the draft finalized by the Electric Lamps and Accessories Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard was first published in 1957 and was subsequently revised in 1966. This revision has been undertaken in view of the developments in the manufacturing techniques of lamps since the last publication of the standard. Lamps of 75 volts, 25/50 watt ratings which are mainly used in locomotives have also been included in this revision.

0.3 The designation and dimensions of caps to be fitted to the lamps are same as those recommended in IEC Publication 61-1 (1969) 'Lamp caps and holders together with gauges for the control of interchangeability and safety: Part I Lamp caps', issued by International Electrotechnical Commission.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies the requirements and tests for tungsten filament electric lamps for railway rolling stock.

2. TERMINOLOGY

2.0 For the purpose of this standard the following definitions shall apply.

---

*Rules for rounding off numerical values (*revised*).

2.1 Type — This term denotes lamps which, independent of the type of cap, are identical in photometric and electrical rating.

2.2 Batch — This term denotes all the lamps of one type put forward at one time for test for acceptance.

2.3 Inspection Test Quantity (ITQ) — The number of lamps to be tested with the object of determining the acceptability of the batch as to marking, mechanical and physical requirements.

2.4 Rating Test Quantity (RTQ) — The number of lamps to be tested with object of determining the acceptability of the batch as to initial readings.

2.5 Life Test Quantity (LTQ) — The number of lamps to be tested with the object of determining the acceptability of the batch as to life.

2.6 Light-Centre Length — The light-centre length is the distance from the geometrical centre of the filament to the contact plate of the cap, including solder.

NOTE — This definition applies whichever type of cap is used.

2.7 Lumen — The lumen is the unit of luminous flux. It is equal to the flux emitted in a solid angle of one steradian by a uniform point source of one candela.

NOTE — The candela (abbreviation: cd) is the unit of luminous intensity. It is of magnitude such that the luminance of a full radiator at the temperature of solidification of platinum is 60 units of luminous intensity per square centimetre.

2.8 Initial Readings — The initial readings are the photometric and electric measurements made at the end of the ageing period.

2.9 Life — The life of a lamp is the number of hours it operates to 'burn out' or to any other criterion of life performance laid down in this standard.

2.10 Rated Voltage — The voltage marked on the lamp.

2.11 Rated Wattage — The wattage marked on the lamp.

2.12 Rated Lumens — The lumens declared.

2.13 Lumen Maintenance — The ratio of luminous flux at the specified time to the initial luminous flux expressed as percentage.

3. CHARACTERISTICS OF LAMPS

3.1 The voltage, wattage ratings, cap designations and finish of lamps shall be as in Table 1.

TABLE 1 VOLTAGE, WATTAGE, CAP DESIGNATION AND FINISH

(*Clause* 3.1)

RATINGS		CAP DESIGNATION	BULB FINISH
Voltage (1)	Wattage (2)	(3)	(4)
V	W		
24	15 20 30	B-22/25 x 26	Clear or frosted
32	15	B-22/25 x 26 or E-27/27	Clear or frosted
32	250	E-27/27	Clear or frosted
75	25	E-27/27	Clear or frosted
	50	E-27/27	Clear or frosted
110	15 25 40	B-22/25 x 26	Clear or frosted
110	60	B-22/25 x 26 or E-27/27	Clear or frosted
120	25 40	B-22/25 x 26 or E-27/27	Clear or frosted
120	100	E-27/27	Clear or frosted

4. REQUIREMENTS

4.1 Mechanical and Physical Requirements

4.1.0 *General* — Lamps shall be so designed and constructed that in all normal and accepted use their performance is reliable and without danger to the user or surroundings. In general, compliance is checked by carrying out all the tests specified.

4.1.1 *Glass Shell* — The glass shells shall be free from defects detriment to service and should comply with IS : 1112-1963*.

4.1.2 *Lamp Dimensions* — Dimensions of lamps shall be in accordance with the values specified in Table 2.

---

*Specification for glass shells for general lighting service lamps (*revised*).

TABLE 2 DIMENSIONS OF LAMPS

(*Clause* 4.1.2)

RATED VOLTAGE (1) V	RATED WATTAGE (2) W	LIGHT CENTRE LENGTH (3) mm	MAXIMUM BULB DIAMETER (4) mm	MAXIMUM OVERALL LENGTH* INCLUDING SOLDER (5) mm
24/32	15	—	53	72
	20	—	53	72
	30	—	53	72
32	250	Actual overall length-1/2 bulb diameter ± 5	81	121
75	25	—	53	72
	30	—	61	110
110/120	15	—	30	62
	25	—	61	103.5
	40	—	61	110
	60	—	61	110
	100	95±2	71	121

*When screw cap E-27/27 is used, the maximum overall length may be correspondingly increased.

4.1.3 *Caps*

4.1.3.1 The shell of the cap shall be of aluminium brass or other suitable material.

4.1.3.2 The dimensions of B-22/25 x 26 Bayonet Caps and E-27/27 Edison Caps shall be as specified in IS : 9206-1979*.

4.1.4 *Attachment of Caps to Bulbs* — Caps shall be attached to bulbs so strongly as to comply with a torsion test carried out in accordance with **7.3**. The bulbs shall withstand a torsional moment of 3 Nm.

4.1.5 *Insulation Resistance of Bayonet Caps* — Insulation resistance between the lamp contacts and the shell of bayonet cap in a dry condition, when measured in accordance with **7.5** shall be not less than 50 megohms.

4.1.6 *Solder* — Solder shall be so applied as not to interfere with the proper engagement of the lamp in the holder.

NOTE — It is not essential that the whole surface of the eyelet should be covered with solder provided there is good electrical contact between the lead in wire and the eyelet and the projecting portion of the wire, if any above the solder, is not more than 1 mm.

---

*Specification for dimensions of caps for tungsten filament general service electric lamps (*third revision*).

4.2 Initial Rating Requirements — Initial readings of individual lamps shall be in accordance with the requirements specified in Table 3. Initial photometric measurements shall be made only after an ageing period of approximately one hour at rated voltage.

TABLE 3 INITIAL RATINGS OF INDIVIDUAL LAMPS

RATED WATTS	MAXIMUM INITIAL WATTS	MINIMUM INITIAL LUMENS OF INDIVIDUAL LAMPS				
		24 Volts	32 Volts	75 Volts	110 Volts	120 Volts
(1)	(2)	(3)	(4)	(5)	(6)	(7)
a) Single coil lamps						
15	16.1	145	130	—	120	—
20	21.3	205	—	—	—	—
25	26.5	—	—	—	210	205
25	26.5	—	—	230	—	—
30	31.7	320	—	—	—	—
40	42.1	—	—	—	420	410
50	52.5	—	—	545	—	—
60	62.9	—	—	—	705	695
100	104.5	—	—	—	—	1 300
b) Coiled coil lamps						
40	42.1	—	—	—	445	435
60	62.9	—	—	—	740	730
250	275	—	4 500	—	—	—

4.3 Requirements for Life Performance — The average life and lumens of the individual lamp at 75 percent of nominal life shall comply with the following requirements.

4.3.1 Average life shall be not less than 1 000 hours for lamps up to 60 W and 500 hours for 100 and 250 W lamps, subject to the following allowances:

Number of Lamps in Life Test	*Percentage Allowance in Average Life*
13	12
14 to 16	11
17 „ 19	10
20 „ 22	9
23 „ 25	8

4.3.2 Lumens of individual lamps at 75 percent of nominal life shall be not less than 85 percent of its initial value except in case of 110-volt 15-watt and 110/120-volt 25-watt lamps for which the limit shall be 78 percent. In the case of 32 V, 250 W lamps the lumens of individual lamps at 75 percent of nominal life shall be not less than 70 percent of its initial value.

5. MARKING

5.1 Lamps shall be distinctly and indelibly marked at the bottom of the bulb with the following information:

a) The mark of the manufacturer;
b) The rated volts (marked V or volts);
c) The rated watts (marked W or watts);
d) 'Coiled coil', where coiled coil and single coil are both standard in the same rating;
e) Country of manufacture;
f) 'Gas filled' or 'gas' when the bulb is gas filled, and 'vacuum' or 'VAC' in case of vacuum; and
g) For lamps for use on railways any other mark specified by the purchaser.

NOTE — The marking of 'gas filled' on coiled coil lamps is, not obligatory as all coiled coil lamps are gas filled.

5.1.1 The product may also be marked with Standard Mark.

5.2. The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manfucaturers or producers may be obtained from the Bureau of Indian Standards.

6. SAMPLING

6.1 Principles of Sampling — The lamps for testing shall be selected in accordance with a mutually agreed method such as to ensure proper representation (*see* Appendix A).

In order to cover the risk of accidental breakage, a certain number of lamps, in addition to the test quantity, shall be selected.

These lamps shall only be substituted for lamps of the test quantities, if necessary to make up the required quantities of lamps for the tests.

It is not necessary to replace an accidentally broken lamp if the result of the test (approval or rejection) is not affected by its replacement provided the required quantity of lamps for the following test is available. If replaced, such a broken lamp shall be neglected in calculating the test results.

NOTE — Accidentally broken lamps include, for example, lamps becoming defective during handling and transportation and also lamps becoming defective for reasons which are not connected with a normal procedure of testing for the measurement of lumens and watts according to 7.7.1.

6.2 Inspection Test Quantity (ITQ) — Inspection test quantity shall be as follows:

a) For lamps having wattage of 100 watts and less:	
1) Normal for batch size up to and including 1 lakh lamps	35
2) Special for batch size exceeding 1 lakh lamps	70
b) For lamps having wattage of more than 100 watts	25

6.3 Rating Test Quantity (RTQ) — From the lamps which have passed the inspection test, there shall be selected at random RTQ as follows:

a) For lamps having wattage of 100 watts and less:	
1) Normal for batch size up to and including 1 lakh lamps	25
2) Special for batch size exceeding 1 lakh lamps	50
b) Lamps having wattage of more than 100 watts	20

6.4 Life Test Quantity (LTQ) — From the lamps which have passed the rating test, there shall be selected at random a LTQ as follows:

a) For lamps having wattage of 100 watts	20
b) For lamps having wattage of more than 100 watts	15

7. TESTS

7.1 Conditions of Tests

7.1.1 *Position of Burning* — Lamps shall burn in a vertical position, cap up, with the exception that 120 V, 100 W and 32 V, 250 W shall burn in horizontal position for ageing and life test.

7.1.2 *Ageing* — Before the lamps are subjected to photometric tests for the first time, they shall be aged for a period of approximately one hour at rated voltage (*see also* **4.2**).

7.2 Visual Examination and Checking for Mechanical, Physical and Marking Requirements — Each lamp of ITQ shall be examined visually as well as checked for physical and mechanical requirements (*see* **4.1**) and marking requirements (*see* **5**).

7.3 Torsion Test — Each lamp of ITQ, shall be inserted in a special holder, having the shape and dimensions given in Fig. 1 and Table 4 or Fig. 2 and Table 5, and fixed to a suitable torsion testing machine. The test shall then be carried out by twisting the bulbs. The torque shall not be applied suddenly, but increased gradually to the moment specified in **4.1.4.** The test shall be carried out both during the inspection test and at the end of the life test.

7.4 Torsion Test After Immersion in Saline Water — In addition to the torsion test specified in **7.3**, an independent saline water test shall be carried out as per **7.4.1** to **7.4.3.** For the purpose of carrying out this test lamps shall be selected equal to the number of lamps selected for ITQ separately. The lamps selected for saline water test shall not be subjected to any other tests.

7.4.1 The lamps shall be conditioned by immersing them in an aqueous solution of 3 percent sodium chloride for four days so as to expose the joint line between the cap and the glass shell to sodium chloride solution. The lamps shall then be taken out and wiped dry by a blotting paper.

7.4.2 Torsion test shall then be conducted on the conditioned lamps in accordance with **7.3**.

7.4.3 The qualifying limits for this test shall be same as per the qualifying limits for any single requirements for ITQ specified in **8.2.**

7.5 Insulation Resistance of Bayonet Caps — The insulation resistance between the shell of the bayonet cap and the contact shall be not less than 50 megohms. The tests shall be carried out immediately after the ageing of the lamp (Approximately one hour at rated voltage) to ensure proper drying and the measurements shall be made one minute after the application of dc voltage of 500 V.

7.5.1 If the insulation resistance value is below the requirement of **7.5**, then additional test be done before ageing. The lamps shall be removed from their wrappers, stored in dry surroundings for not less than 48 hours and the external surface shall be wiped with a dry cloth. In case the insulation resistance is still found to be insufficient, the lamp shall be stored in a warm dry atmosphere for a week and then retested for insulation.

7.6 Initial Rating Tests — Measurements shall be made for initial watts and initial lumens at rated voltage with a suitable photometric integrator (*see also* IS : 2407-1963*). The accuracy of the voltmeter and ammeter, when used for the test, shall be not worse than 0.2 and 0.3 percent respectively of full-scale values.

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*Specification for photometric integrators.

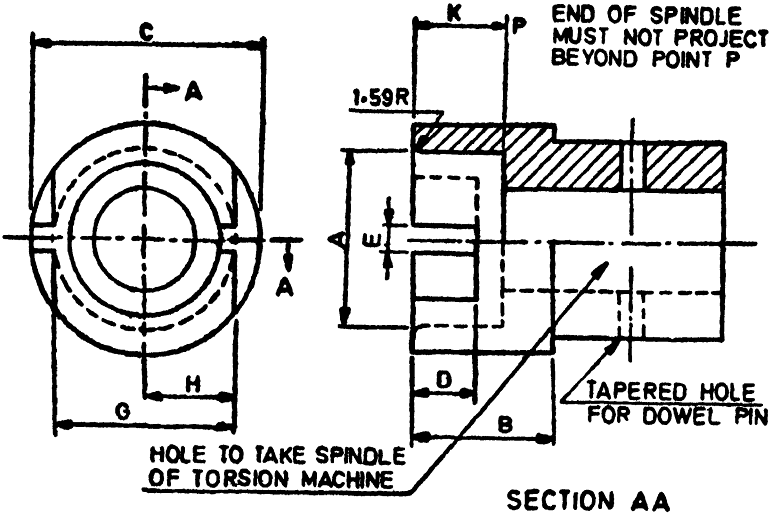
C
A
A
H
G
K
P
END OF SPINDLE MUST NOT PROJECT BEYOND POINT P
1·59R
A
E
D
B
TAPERED HOLE FOR DOWEL PIN
HOLE TO TAKE SPINDLE OF TORSION MACHINE
SECTION AA

FIG. 1 METAL HOLDERS FOR TORSION TEST FOR B-22/25 X 26 CAP

TABLE 4 DIMENSIONS OF METAL HOLDERS FOR TORSION TEST FOR BAYONET CAP B-22

(*Clause* 7.3, and *Fig.* 1)

REF LETTER (1)	DIMENSION (2) mm
A	22.17 + 0.03
B	19.05 ± 0.30
C	28.57 ± 0.30
D	9.52 ± 0.30
E	3.00 + 0.17
G	24.61 ± 0.30
H	12.30 ± 0.30
K	12.70 ± 0.30

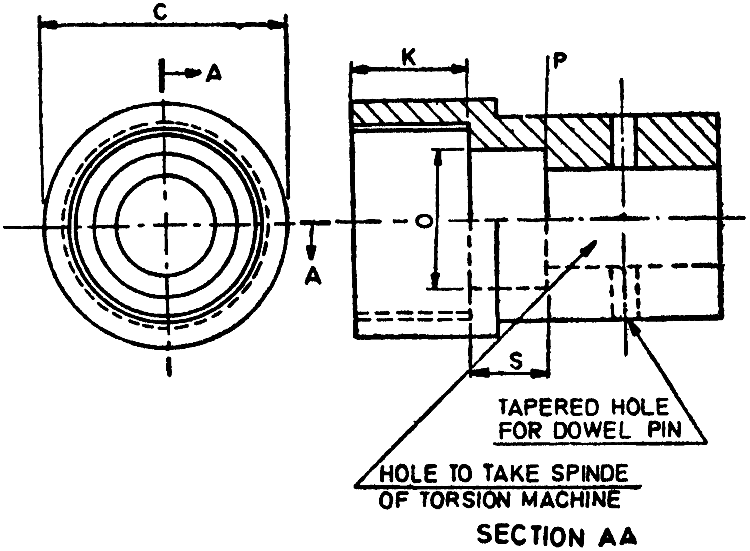
C
A
A
K
P
O
S
TAPERED HOLE FOR DOWEL PIN
HOLE TO TAKE SPINDE OF TORSION MACHINE
SECTION AA

FIG. 2 METAL HOLDERS FOR TORSION TEST FOR E-27 CAP

TABLE 5 DIMENSIONS OF METAL HOLDERS FOR TORSION TEST FOR SCREW CAP E-27

(*Clause* 7.3, and *Fig.* 2)

REF LETTER (1)	DIMENSION, mm (2)
C	33.02 ± 0.30
K	10.92 ± 0.30
O	23.01 ± 0.30
S	11.68 ± 0.30

7.7 Life Test

7.7.1 *Test Voltage* — The test voltage shall be a stable voltage between 100 and 110 percent of the rated voltage, the value to be selected by the mutual agreement.

The equivalent life at rated volts shall be determined as follows:

$$L_R = L_T \left(\frac{V_T}{V_R} \right)^n$$

where

L_R = life at rated voltage,
L_T = life at test voltage,
V_T = average effective voltage during life test,
V_R = rated voltage, and
n = 13 for vacuum and 14 for gas filled lamps.

The lamps shall be tested on alternating current at a frequency of a nominal value between 40 Hz and 60 Hz.

NOTE 1 — In general testing at a voltage in excess of rated voltage is done mainly for reasons of economy.

NOTE 2 — In case of 32 V, 250 lamp, the selected voltage should not exceed 105 percent.

7.7.2 *Voltage Control* — The momentary fluctuation of the test voltage during the life test shall not exceed ± 1 percent, and the mean effective value of the test voltage during the life test shall be taken for the calculations given in **7.7.1.** The voltage shall be free from perceptible flicker.

NOTE — Mean effective value of the voltage shall be obtained by a suitable V^2 meter (*see* Appendix B)

7.7.3 *Switching 'On' and 'Off' During Life Test* — Lamps on life test shall be switched off twice during every 24 hours of burning for minimum 15 minutes. Such time shall not be considered as part of the life of the lamp.

7.7.4 *Accidentally Broken Lamps* — If one or more lamps break accidentally in handling during life test, the life test results may be computed on the basis of results obtained on the remainder of the life test quantity, provided the number of the latter is not less than 13.

7.7.5 *Measurements for Lumens at* 75 *Percent of Nominal Life* — Each lamp of the life test quantity shall be measured for lumens at rated voltage at 75 percent of nominal life ±24 hours or its equivalents, if forced testing is used.

7.7.6 *Completion of Test* — The life test shall be considered to have terminated at 125 percent of nominal life, or its equivalent if forced testing is used.

7.8 Vibration Test (Under consideration).

NOTE — The data regarding vibrations encountered in railway rolling stock is at follows :

Type	ACCELERATION		FREQUENCY	
	Vertical	Lateral	Vertical	Lateral
Coaches	0.75 to 2.25 g	0.03 to 0.11 g	1 to 10 c/s	1 to 10 c/s
Locomotives	1.0 to 1.2 g	0.6 to 0.9 g	4 to 30 c/s	4 to 35 c/s

8. CONDITIONS OF COMPLIANCE

8.1 General — If any test quantity fails to satisfy any of the requirements of **8.2**, **8.3** and **8.4**, the batch shall be rejected and no subsequent tests shall be carried out from that batch (*see also* Appendix C).

8.2 Mechanical, Physical and Marking Requirements — A batch shall be considered to comply with the requirements of **4.1** and **5.1** if the number of lamps failing does not exceed the qualifying limits given below:

a) For lamps having wattage of 100 watts and less:

   1. For a normal batch having ITO of 35 lamps:

      i) 3 for any one of. the tests (**4.1.1** to **4.1.6**, **5** and **7.4**); and
      ii) 7 for all the tests (**4.1.1** to **4.1.6** and **5**).

   2. For a special batch having ITQ of 70 lamps:

      i) 5 for any one of the tests (**4.1.1** to **4.1.6**, **5** and **7.4**); and
      ii) 12 for all the tests (**4.1.1** to **4.1.6** and **5**).

b) For lamps having wattage more than 100 watts :

   1. For a batch having ITQ of 25 lamps :

      i) 2 for any one of the tests (**4.1.1** to **4.1.6**, **5** and **7.4**); and
      ii) 5 for all the tests (**4.1.1** to **4.1.6** and **5**).

8.3 Initial Ratings — All the lamps chosen for RTQ shall be tested for initial wattage and lumen. A batch shall be considered to comply with the requirements of initial ratings if:

a) For lamps having wattage of 100 W and less:

   1. For a normal batch having RTQ of 25 lamps :

      i) the number of lamps whose wattage is above the maximum value specified in **4.2** does not exceed 4, and

   - ii) the number of lamps whose lumen values are below the minimum values specified in **4.2** does not exceed 4.

2. For a special batch having RTQ of 50 lamps :

   - i) the number of lamps whose wattage is above the maximum value specified in **4.2** does not exceed 7, and
   - ii) the number of lamps whose lumen values are below the minimum values specified in **4.2** does not exceed 7.

b) For lamps having wattage more than 100 watts:

1. For a batch having RTQ of 20 lamps :

   - i) the number of lamps whose wattage is above the maximum values specified in **4.2** does not exceed 3, and
   - ii) the number of lamps whose lumen values are below the minimum values specified in **4.2** does not exceed 3.

8.4 Life Performance — Life test and measurement of lumen after 75 percent of rated life should be done on the samples chosen for LTQ. A batch shall be considered to comply if:

a) the average life of the LTQ attains the value set out in **4.3**.

b) the total number of lamps having lives shorter than 70 percent of rated life, together with those failing to pass the requirements for luminous flux at 75 percent for individual lamps, set out in **4.3** does not exceed 4 for lamps having wattage up to 100 W and less, and 3 for lamps having wattage more than 100 W.

APPENDIX A

(*Clause* 6.1)

SUGGESTED METHOD OF SELECTION

A-1. The method of selection of lamps is given in **A-2** which is limited up to 100 W. For reasons of economy, the test quantities for lamps of ratings above 100 W may be decreased by mutual agreement. Conditions of compliance are evaluated on a similar statistical basis as for larger quantities and shall be included in the mutual agreement.

A-2. BATCHES

A-2.1 Batches Consisting of 1 000 Lamps or Less — For batches consisting of 10 or less containers, lamps shall be selected from every container. For batches consisting of more than 10 containers, lamps shall be selected from at least one-half of the total number of containers in the batch, with a minimum of 10 containers.

A-2.2 Batches Consisting of More than 1 000 Lamps — As nearly as possible from one-third of the total number of containers in the batch, with a minimum of 10 containers.

APPENDIX B

(*Clause* 7.7.2)

BRIEF DESCRIPTION OF V^2 METER

B-1. The V^2 meters are based on the same principle as the normal single phase induction kilo watt-hour meters. The difference is that a fine-wired coil in series with a high resistance has been substituted for the normal current coil. This coil as well as the normal voltage coil are both connected in parallel to the mains.

B-2. As the speed of the rotation of the disc is proportional to the voltage on the voltage coil and the current in the current coil, and as the latter is proportional to the voltage, with the built-in resistance constant, the speed of rotation of the disc is proportional to the square of the voltage. Hence the reading per unit of time is proportional to the square of the voltage.

B-2.1 The measurement of the time is done by a clock-work starting and stopping with voltage on and off. If the clock-work is of the synchronous type, it should be ensured that the frequency is correct. If it is of the electrically worked self starting type with a balance, it should be compared with a normal good watch adjusted in the normal way.

B-3. The accuracy of the V^2 meter depends on the steadiness of the voltage used. The accuracy is generally about 0.25 percent when the voltage used is within ± 1 percent. In this respect the V^2 meter is more accurate than any recording voltmeter the accuracy of which is mostly not greater than 2 percent of the full-scale value.

APPENDIX C

(*Clause* 8.1)

STATISTICAL BASIS OF TEST QUANTITIES AND CONDITIONS OF COMPLIANCE

C-1. The acceptance limits given under **8.2**, **8.3** and **8.4** are such that there is at least a 0.975 (39 out of 40) probability of compliance provided that the bulk of the manufacturers' production contains :

a) not more than 2 percent failing in any single requirement under **4.1** and **5**, and not more than 5 percent failing in the combined requirements;

b) not more than 7 percent failing in the requirements for initial ratings when each is taken separately and not more than 10 percent for combined requirements; and

c) not more than 8 percent failing in the individual life and lumen requirements at 75 percent of nominal life.

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